

Integration - PVA worksheet

Answer Key

① a) $a(t) = -32$

$$v(t) = \int -32 dt$$

$$v(t) = -32t + C$$

$$29 = -32(3) + C$$

$$125 = C$$

$$v(t) = -32t + 125$$

$$s(t) = \int v(t) dt$$

$$s(t) = \int (-32t + 125) dt$$

$$s(t) = -16t^2 + 125t + C$$

$$129 = -16(9)^2 + 125(9) + C$$

$$300 = C$$

$$s(t) = -16t^2 + 125t + 300$$

b) $s(0) = 300 \text{ ft}$
 $v(0) = 125 \text{ ft/sec}$

c) $v(t) = 0$

$$t = 3.9063 \text{ sec}$$

d) $s(3.9063) = 544.1406 \text{ ft}$

e) $s(t) = 0$

$$t = 9.738 \text{ sec}$$

$$v(9.738) = -186.616 \text{ ft/sec}$$

② a) $a(t) = -32$

$$v(t) = \int a(t) dt$$

$$v(t) = \int -32 dt$$

$$v(t) = -32t + C$$

$$-40 = -32(1) + C$$

$$-8 = C$$

$$v(t) = -32t - 8$$

$$s(t) = \int v(t) dt$$

$$s(t) = \int (-32t - 8) dt$$

$$s(t) = -16t^2 - 8t + C$$

$$37 = -16(.5)^2 - 8(.5) + C$$

$$45 = C$$

$$s(t) = -16t^2 - 8t + 45$$

b) $s(t) = 0$

$$t = 1.4456 \text{ sec}$$

$$v(1.4456) = -54.2592 \text{ ft/sec}$$

c) $s(1.1) = 16.84 \text{ ft}$

$$v(1.1) = -43.2 \text{ ft/sec}$$

③ $a(t) = 2t - 6$

a) $v(t) = \int a(t) dt$

$v(t) = \int (2t - 6) dt$

$v(t) = t^2 - 6t + C$

$-2 = 4^2 - 6(4) + C$

$6 = C$

$v(t) = t^2 - 6t + 6$

$s(t) = \int v(t) dt$

$s(t) = \int (t^2 - 6t + 6) dt$

$s(t) = \frac{1}{3}t^3 - 3t^2 + 6t + C$

$5 = \frac{1}{3}(3)^3 - 3(3)^2 + 6(3) + C$

$5 = C$

$s(t) = \frac{1}{3}t^3 - 3t^2 + 6t + 5$

b) $v(t) = 0$

Total Distance:

$t = 1.2679 \text{ sec}$

$t = 4.7321 \text{ sec}$

$\int_0^6 |t^2 - 6t + 6| dt = 13.8565 \text{ ft}$

Recommended
* method

$\int_0^{1.2679} v(t) dt + \left| \int_{1.2679}^{4.7321} v(t) dt \right| + \int_{4.7321}^6 v(t) dt$

$3.4641 + 6.9282 + 3.4641 = 13.8564 \text{ ft}$

$s(0) = 5$

$s(1.2679) = 8.4641$

$s(4.7321) = 1.5359$

$s(6) = 5$

$\left. \begin{array}{l} \\ \\ \\ \end{array} \right\} \begin{array}{l} 3.4641 \\ 6.9282 \\ 3.4641 \end{array}$

13.8564 ft

3b (cont):

$$\text{Displacement: } \int_0^6 v(t) dt = \boxed{0 \text{ ft}}$$

$$\begin{array}{l} \text{---} \quad \text{or} \quad \text{---} \\ f(0) = 5 \\ f(6) = 5 \end{array} \} \boxed{0 \text{ ft}}$$

④ Total Distance:

$$\int_0^{9.738} |v(t)| dt = \boxed{788.29 \text{ ft}}$$

Displacement:

$$\int_0^{9.738} v(t) dt = \boxed{-300 \text{ ft}}$$